Container receptacles 1164 and 1166 preferably include bottle-present sensors (not shown) for verifying that bottles are properly positioned in their respective receptacles. The bottle-present sensors are preferably diffuse reflective type optical sensors available from SUNX/Ramco Electric, Inc., of West Des Moines, Iowa, model EX-14A.

The analyzer 50 will not begin performing any assays if the assay manager program determines that any of the bulk-fluid containers in the left-side drawer 1106 are initially empty.

The capacitive proximity fluid level sensors, the various bottle-present sensors, the tiplet-waste-bin-full sensor, and the tiplet-waste-bin-present sensors are all connected to the printed circuit board 1182, and the printed circuit board 1182 is connected to the embedded controller of the analyzer 50.

Four solenoid valves (not shown) are mounted below the solenoid valve mounting panel 1186. The solenoid valves connect bulk fluid bottles where fluids are stored in pairs of bottles, i.e., the bottles 1140, 1142 containing wash buffer solution, the two bottles 1146 containing the "Detect I" agent, the two bottles 1168 containing oil, and the two bottles 1170 containing the "Detect II" agent. The solenoid valves, in response to signals from the respective capacitive proximity sensors, switch bottles from which fluid is being drawing when one of the two bottles containing the same fluid is empty. In addition, the solenoid valves may switch bottles after a prescribed number of tests are performed. The preferred solenoid valves are teflon solenoid valves available from Beco Manufacturing Co., Inc. of Laguna Hills, California, model numbers S313W2DFRT and M223W2DFRLT. The two different model numbers correspond to solenoid valves adapted for use with two different tube sizes. Teflon solenoid valves are preferred because they are less likely to contaminate fluids flowing through the valves and the valves are not damaged by corrosive fluids flowing through them.

Bottle 1136 (see FIGURE 52) is a vacuum trap held in a vacuum trap bracket 1137, and bottle 1138 contains a deactivating agent, such as bleach-containing reagent. Again, bottle-present sensors are preferably provided to verify the presence of bottles 1136 and 1138.

A hand-held bar code scanner 1190 may be provided in the lower chassis 1100 for scanning information provided on scannable container labels into the assay manager program. Scanner 1190 is connected by a cord to printed circuit board 1182 of the left-side drawer 1106 and is preferably stowed on a bracket (not show) mounted on dividing wall 1143. Scanners available from Symbol Technologies, Inc., of Holtsville, New York, series LS2100, are preferred.

SPECIMEN RING AND SPECIMEN TUBE TRAYS

Specimens are contained in the specimen tubes 320, and the tubes 320 are loaded into the tube trays 300 outside the analyzer 50. The trays 300 carrying the specimen tubes 320 are placed onto the specimen ring 250 through the access opening provided by opening the flip-up carousel door 80.

Referring to FIGURES 5 and 6, the first ring assembly, or specimen ring, 250 is formed of milled, unhardened aluminum and includes a raised ring structure defining an annular trough 251 about the outer periphery of ring 250 with a plurality of raised, radially extending dividers 254 extending through trough 251. Preferably, nine dividers 254 divide the trough 251 into nine arcuate specimen tube tray-receiving wells 256. The trough 251 and wells 256 define an annular fluid container carrier portion constructed and arranged to carry a plurality of containers as will be described below.

Specimen ring 250 is preferably rotationally supported by three 120°-spaced V-groove rollers 257, 258, 260 which engage a continuous V-ridge 262 formed on the inner periphery of ring 250, as shown in FIGURES 5, 6, and 6A so that the ring 250 is rotatable about a first central axis of rotation. The rollers are preferably made by Bishop-Wisecarver Corp. of Pittsburg, California, model number W1SSX. Rollers 257 and 260 are rotationally mounted on fixed shafts, and roller 258 is mounted on a bracket which pivots about a vertical axis and is spring biased so as to urge roller 258 radially outward against the inner periphery of ring 250. Having two fixed rollers and one radially movable roller allows the three rollers to accommodate an out-of-round inner periphery of the ring 250.

Specimen ring 250 is driven by stepper motor 264 (VEXTA stepper motors available from Oriental Motor Co., Ltd. of Tokyo, Japan as model number PK266-01A are preferred) via continuous belt 270 (preferably available from SDP/SI of New Hyde Park, New York, as model number A6R3M444080) which extends over guide rollers 266, 268 and around the outer periphery of ring 250. A home sensor and a sector sensor (not shown), preferably slotted optical sensors, are provided adjacent the ring 250 at a rotational home position and at a position corresponding to one of the specimen tube tray receiving wells 256. The ring 250 includes a home flag (not shown) located at a home position on the wheel and nine equally-spaced sector flags (not shown) corresponding to the positions of each of the nine specimen tube tray receiving wells 256. The home flag and sector flags cooperate with the home sensor and sector sensors to provide ring position information to the assay manager program and to control the ring 250 to

stop at nine discrete positions corresponding to established coordinates for user re-load and access by pipette unit 450. Preferred sensors for the home sensor and sector sensor are Optek slotted optical sensors, model number OPB857, available from Optek of Carrollton, Texas.

A specimen cover is disposed over a portion of the annular fluid container carrier portion, or trough 251, and comprises an arcuate cover plate 138 fixed in an elevated position with respect to the wheel 250 on three mounting posts 136. Plate 138 has an arcuate shape generally conforming to the curve of the trough 251. A first opening 142 is formed in the plate 138, and a second opening 140 is formed in the plate 138 at a greater radial distance from the axis of rotation of ring 250 than opening 142 and at a circumferentially-spaced position from opening 142.

Referring to FIGURES 55-57, each specimen tube tray 300 comprises a test tube rack structure that is curved to conform to the curvature of the ring 250. Each tray 300 comprises a central wall structure 304 with lateral end walls 303 and 305 disposed on either end of wall 304. A floor 312 extends across the bottom of the tray 300. The principle purposes of specimen tube tray 300 are to hold specimen tubes on the specimen ring 250 for access by the specimen pipette assembly 450 and to facilitate loading and unloading of multiple specimen tubes into and from the analyzer.

A plurality of Y-shaped dividers 302 are equidistantly spaced along opposite edges of the tray 300. Each two adjacent dividers 302 define a test-tube receiving area 330. End wall 303 includes inwardly bent flanges 316 and 318, and end wall 305 includes inwardly bent flanges 326 and 328. The respective inwardly bent flanges of end walls 303 and 305 along with the end-most of the dividers 302 define the end-most tube receiving areas 332. The receiving areas 330, 332 are arcuately aligned along two arcuate rows on opposite sides of central wall structure 304

Referring to FIGURE 57, within each tube receiving area 330, 332, a leaf spring element 310 is attached to central wall 304. Leaf spring element 310, preferably formed of stainless spring steel, elastically deflects when a test tube 320 is inserted into the tube-receiving area 330 or 332 and urges the tube 320 outwardly against the dividers 302. Thus, the tube 320 is secured in an upright orientation. The shape of the dividers 302 and the elasticity of the leaf spring elements 310 allow the tray 300 to accommodate specimen tubes of various shapes and sizes, such as tubes 320 and 324. Each tray 300 preferably includes nine dividers 302 along each edge to form, along with end walls 303 and 305, ten tube-receiving areas 330, 332 on each side of central wall structure 304 for a total of twenty tube-receiving areas per tray. Indicia for